

Hydroid and medusa stages of the new species *Ectopleura obypa* (Cnidaria: Hydrozoa: Tubulariidae) from Brazil

Alvaro E. Migotto and Antonio C. Marques

(AEM) Centro de Biologia Marinha, Universidade de São Paulo, Caixa Postal 83,
11600-970 São Sebastião, SP, Brazil;

(ACM) Departamento de Biologia, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto,
Universidade de São Paulo, Av. Bandeirantes 3900, 14040-901 Ribeirão Preto, SP, Brazil

Abstract.—*Ectopleura obypa*, a new species referable to the family Tubulariidae, is described from the southeastern coast of Brazil. Specimens were collected on experimental panels and other artificial substrates at depths from about 1 to 15 m. The hydroid stage is a remarkable green color when blastostyles are developed. A free medusa, with 2 opposed capitate marginal tentacles and 8 meridional tracks of nematocysts on the exumbrella, is present in the life cycle.

During a study of hydroid recruitment on experimental plates in waters of southeastern Brazil we discovered a species of *Ectopleura*, not yet described, remarkable for its bright green color. Several other specimens of the species were found at various times later on other artificial substrates including nylon ropes, buoys, and iron pipes. Specimens kept in the laboratory and cultured under controlled conditions liberated free medusae.

The genus *Ectopleura* L. Agassiz, 1862, a basal clade of the family Tubulariidae, has 20 valid species divided in two phylogenetic groups distinguishable basically by their cnidomes and stolon growth pattern (Petersen 1990:160). There is much confusion between the genera *Tubularia* and *Ectopleura*, the first having sessile gonophores and the latter traditionally considered as having free medusae (e.g., Millard 1975: 31–32; Bouillon 1985:112). However, Petersen (1979:120; 1990:160) redefined the tubulariid genera based on features of the hydroid stage. His classification of tubulariid polyps included: the solitary *Zyzyzus*, with a thin perisarc and tuber-like attachment of hydrocaulus; the solitary *Tubularia* with firm perisarc and producing either eu-

medusoid or cryptomedusoid gonophores of the symmetrical type; the solitary *Hybocodon*, producing fixed asymmetrical gonophores; the colonial or solitary *Ectopleura* with firm perisarc and producing either free medusae or fixed gonophores; the solitary or colonial *Ralpharia* with firm perisarc and producing reduced medusae with an internal raised collar around bell opening; and the solitary *Bouillonina* with barrel-shaped hydranth, firm perisarc and reduced medusae.

Material and Methods

Hydroids of *Ectopleura obypa*, new species, were collected on a number of substrates (experimental plates, ropes, buoys, iron pipes) on the coast of São Sebastião, São Paulo State, Brazil. Type material, studied here, was collected by skin and SCUBA diving from a light buoy in the São Sebastião Channel. Part of the material was anesthetized in a 1:1 solution of 7.5% MgCl₂ solution and seawater, and preserved in 4% formaldehyde solution in seawater; part was kept alive in the laboratory. Live hydranths were examined under a stereomicroscope, and newly liberated medusae

were transferred to finger bowls and kept in constant temperature chambers at 19, 24 and 26°C with a 12 h light/12 h dark photoperiod. Water in the bowls was changed daily, shortly after medusae were measured and fed with *Artemia* nauplii.

Stems for scanning electron microscopy (SEM) were post-fixed in 1% OsO₄, dehydrated in a graded series of ethanol, dried in a critical-point drier, and sputter-coated with gold. Nematocyst types and their distributions were determined using a light microscope with interference-contrast. Nematocyst nomenclature used here is that of Mariscal (1974) and Millard (1975). Only capsules of undischarged nematocysts were measured. Abbreviations are: AM (collection of A. Migotto); MZUSP (Museu de Zoologia da Universidade de São Paulo, São Paulo); USNM (United States National Museum, Smithsonian Institution, Washington D.C.).

Results and Discussion

Genus *Ectopleura* L. Agassiz, 1862

Ectopleura obypa, new species

Figs. 1–3; Tables 1–2

Material.—Holotype, 1 hydroid colony, 2.0 cm high, São Sebastião Channel, São Sebastião, São Paulo State, Brazil (23°49.86'S, 045°25.28'W), 4 Jan 1996, 5 m, colony with gonophores and several hydranths growing epibiotically on barnacles and mussels, on light buoy, collected by hand, coll. A. E. Migotto (MZUSP-12.813); paratypes (all from same locality as holotype), medusae liberated in the laboratory 6 Jan 1996 from hydroid colony collected 4 Jan 1996, 6 medusae ca. 2 h old (AM1325); 2 medusae, 6 d old (MZUSP-12.814); 4 medusae, 7 d old (AM1327); 26 medusae, 34 d old (AM1328); one hydroid colony 35 mm high, on mussels and ascidian, with gonophores, 16 Jan 1996, 2 m, coll. A. C. Morandini (AM1323); one hydroid colony 25 mm high, on mussel, with gonophores, 17 Jun 1996, 2–3 m, coll. A. E. Migotto (AM1324; USNM 99449); 84 medusae ca.

3 h old, liberated in the laboratory on the same day of collection, from colony collected 17 Jun 1996 (AM1329).

Description.—colony up to 35 mm high, arising from branched stolons. Hydrocaulus unbranched, increasing in width from base to distal end, covered with a smooth light brown perisarc without annuli. Neck region long (Figs. 1C, 3A), flexible and contractile, covered by a filmy perisarc; extended neck up to 3.5 times longer than contracted; in live specimens, neck entirely white or light pink, with white pigments concentrated in 2 narrow longitudinal bands. Hydranth vasiform, pink-white and transparent, with one whorl of 16–30 aboral tentacles and one whorl of 14–29 oral tentacles (Figs. 1A, 2A, 3A). Aboral tentacles long, filiform, laterally flattened (Fig. 1A), with nematocysts concentrated along adoral surface, and on tip. Oral tentacles short, circular in cross section, basal part adnate to hypostome (Fig. 1D), with nematocysts concentrated in a terminal capitulum and 1–3 irregular swellings on the adoral surface of the tentacle (Fig. 1B, D); free part of oral tentacles slightly fused at base (Fig. 1B). Medusa buds on 4–14 (usually 7–10) blastostyles arising above aboral tentacles; older medusa buds at ends of blastostyles (Fig. 3B). Blastostyles yellow-green, composed of a main stem on which medusae arise either directly or from irregular branches; main stem may bifurcate. In large specimens the developed blastostyles hang between aboral tentacles.

Newly-liberated medusa with thin umbrella, dome-shaped and without a distinct apical projection but with a small apical canal, with 8 slightly raised exumbrellar, meridional nematocyst tracks; with 4 marginal bulbs, 2 of which with opposed tentacles; marginal tentacles with a terminal knob and 1–3 abaxial nematocyst clusters (Fig. 2B); abaxial nematocyst cluster grows and involves the tentacle (Figs. 2D, 3C). Manubrium tubular, without lips, with nematocysts around mouth, and about $\frac{2}{3}$ the length of bell cavity. Apical

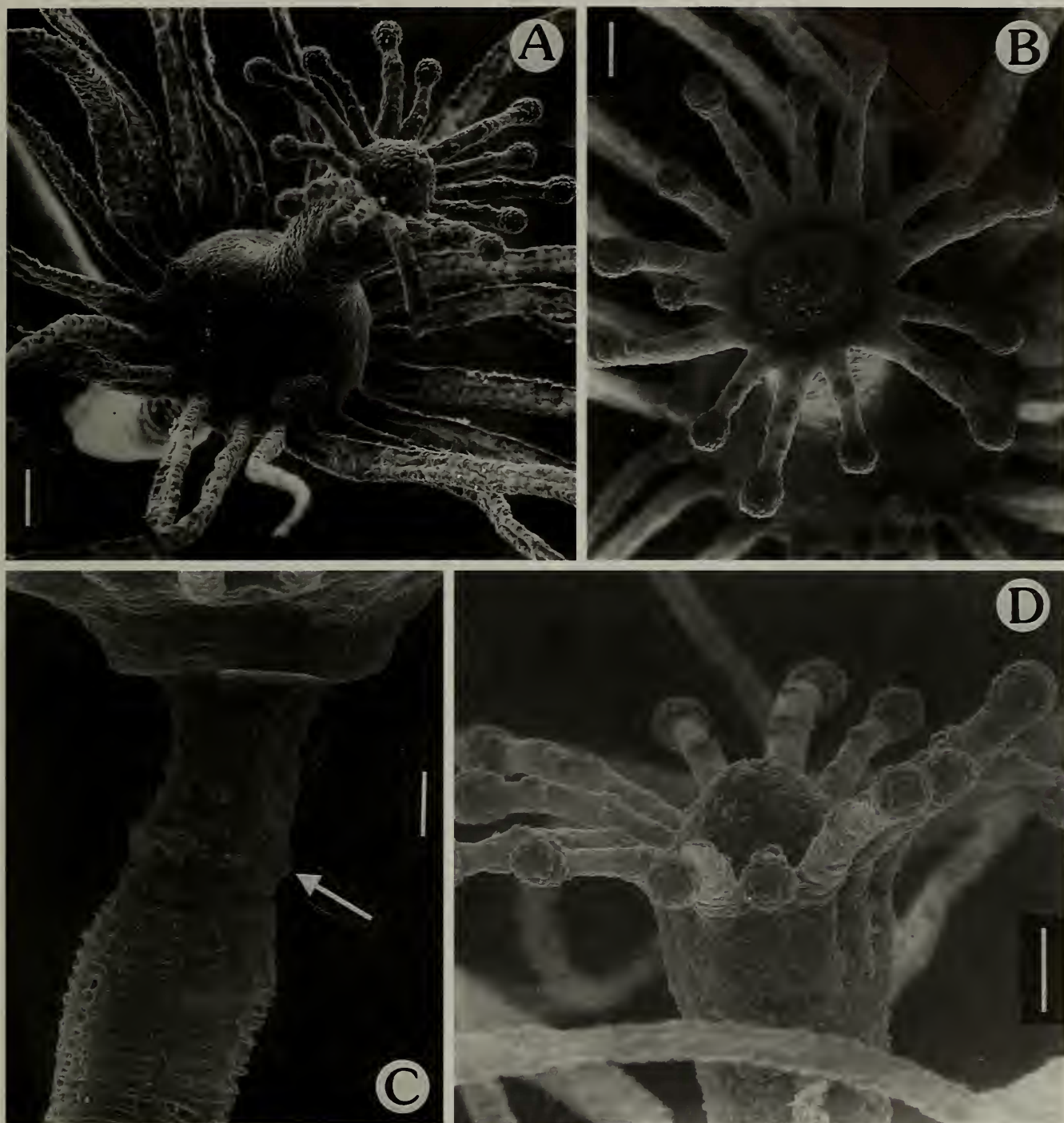


Fig. 1. Scanning electron micrographs of *Ectopleura obypa*, new species. A, fronto-lateral view of hydranth, note incipient blastostyles just above aboral tentacles; B, oral view of hydranth; C, neck region; the arrow points to the groove where filmy perisarc is secreted; D, lateral view of hypostome and oral tentacles. Scale bar, A, B = 100 μm ; C, D = 50 μm .

canal short. Color: umbrella transparent; subumbrella green when illuminated sideways; manubrium pink-white; marginal bulbs milky-white with small red dots.

The types and measurements of nematocysts of hydranth and medusa are listed below. Morphological character variation of many colonies and newly released medusae are in Tables 1 and 2, respectively.

Nematocysts.—(in μm) (Fig. 3D)

Hydranth

Oral tentacle:

Stenotele — 13.5 — 14.0 \times 12.0 — 13.0 (abundant)

Stenotele — 6.0 — 8.5 \times 6.0 — 7.5 (abundant)

Microbasic eurytele — 9.0 — 10.0 \times 4.0 — 4.5

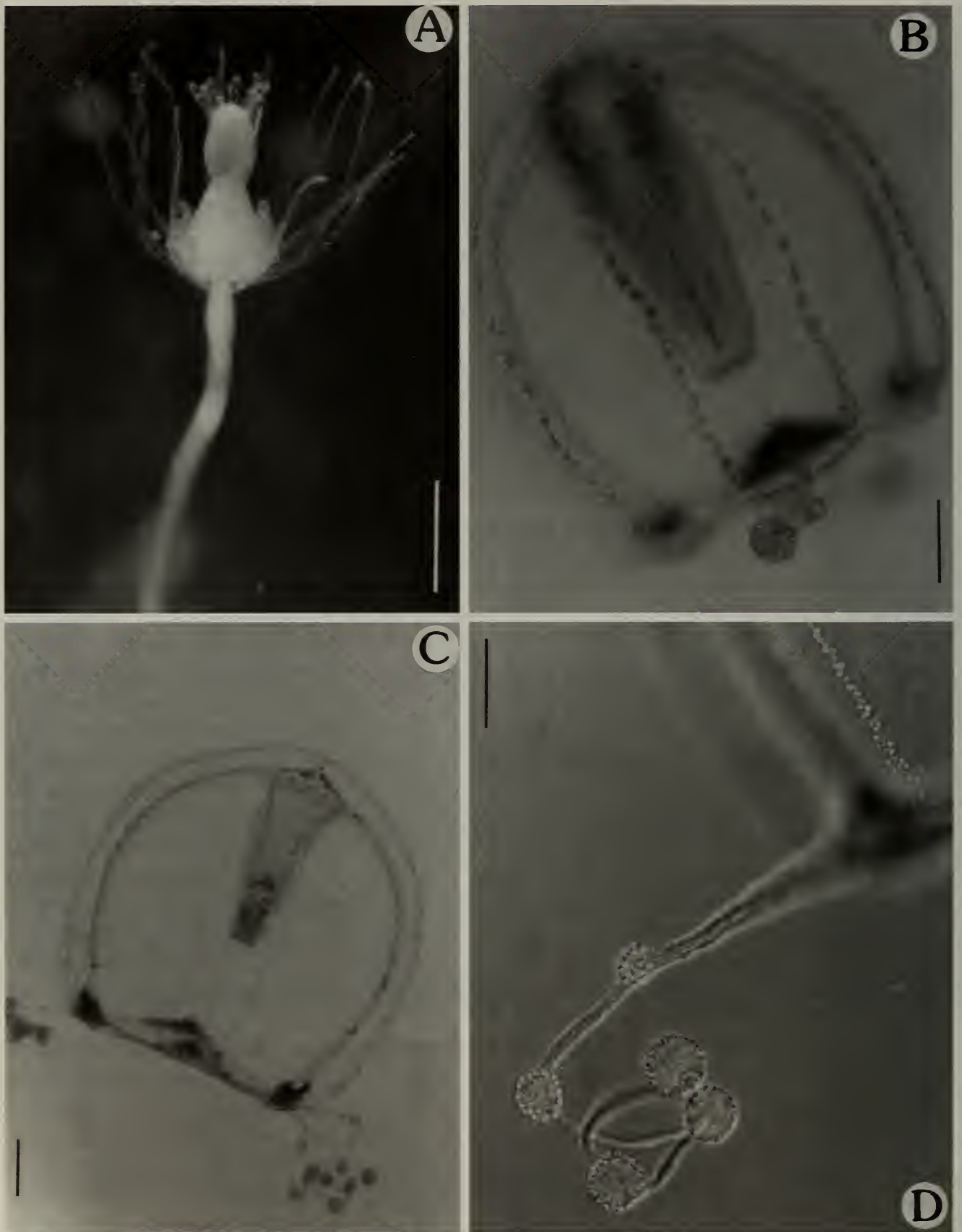


Fig. 2. Photographs of live specimens of *Ectopleura obypa*, new species. A, lateral view of a hydranth with incipient blastostyles; B, lateral view of a newly-liberated medusa; C, lateral view of a 6-day-old medusa; D, detail of a tentacle of a 7-day-old medusa. Scale bar, A = 1.0 mm; B, D = 100 μ m; C = 200 μ m.

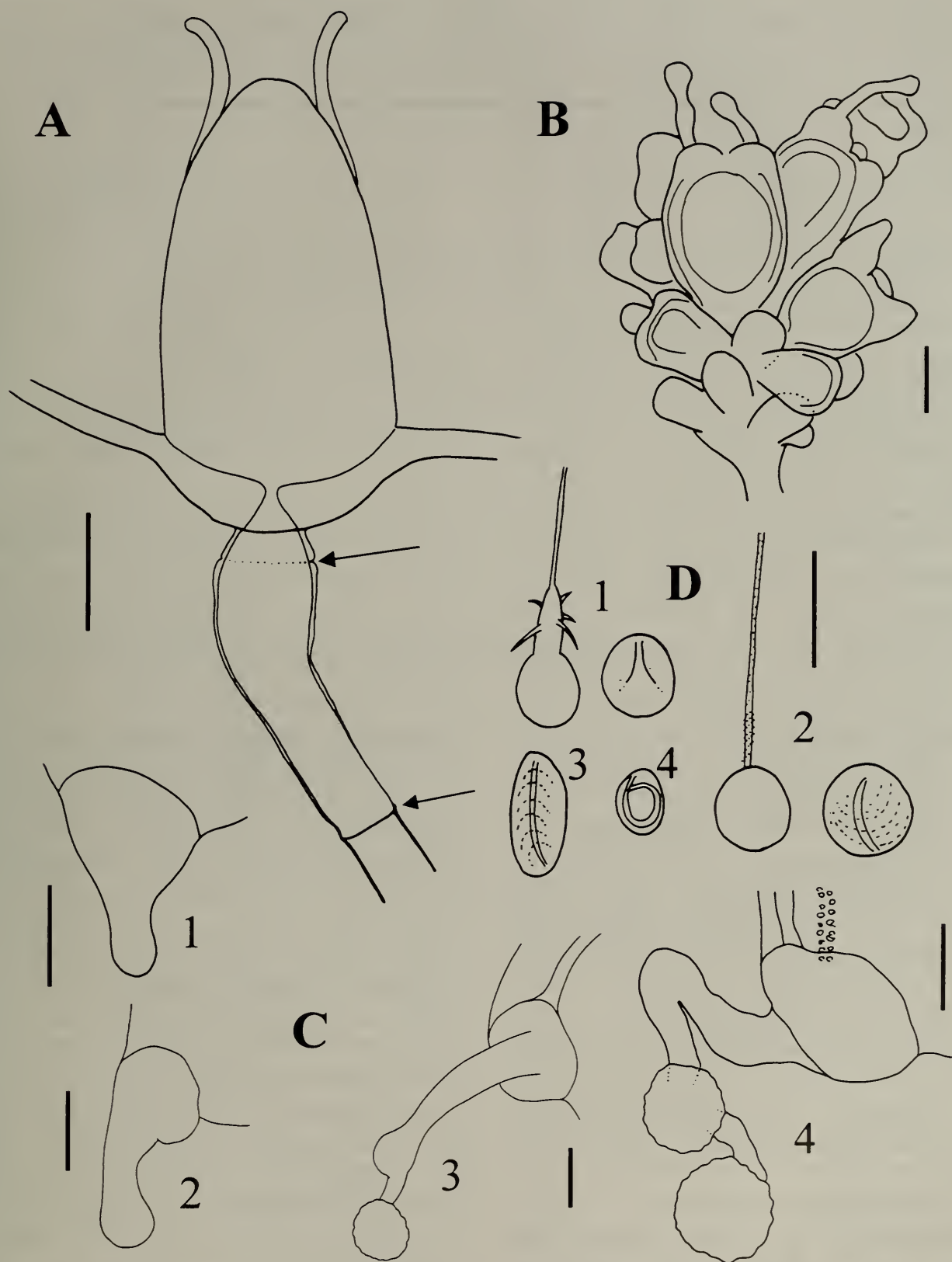


Fig. 3. *Ectopleura obypa*, new species. A, outline diagram of hydranth, traced from a whole mount preparation; the upper arrow points to the region where the film perisarc is secreted; the lower arrow indicates the beginning of the firm perisarc; B, lateral view of a blastostyle with several well developed medusa buds; C, sequence in the development of a medusa tentacle; C4 is the oldest stage, just before liberation from blastostyle; D, nematocysts; D1, stenotele; D2, basitrichous isorhiza; D3, microbasic mastigophore; D4, desmonome. Scale bar, A = 0.5 mm; B = 100 μ m; C = 50 μ m; D = 10 μ m.

Table 1.—Morphological character variation of hydroids of *Ectopleura obypa*, new species.

	Measurements [average \pm SD (range)]
Hydrocauli	
Length (mm)	18.5 \pm 6.9 (0.87–30.3)
Distal diameter (mm)	0.20 \pm 0.03 (0.13–0.26)
Proximal diameter (mm)	0.34 \pm 0.07 (0.22–0.60)
Hydranth	
Total length (mm)	1.85 \pm 0.55 (1.18–3.30)
Length from the base of aboral tentacles to the apex of hypostome (mm)	1.41 \pm 0.42 (0.88–2.70)
Diameter at the level of aboral tentacles (mm)	1.09 \pm 0.30 (0.62–1.80)
Tentacles	
Aboral	
Number	23.8 \pm 2.9 (16–30)
Length (mm)	2.50 \pm 0.59 (0.91–3.90)
Oral	
Number	20.8 \pm 3.25 (14–29)
Length (mm)	0.79 \pm 0.16 (0.42–1.20)
Gonosome	
Number	8.55 \pm 2.10 (4–14)
Length (mm)	0.91 \pm 0.55 (0.15–2.10)

Aboral tentacle:

Stenotele – 13.5 – 14.0 \times 12.0 – 13.0 (rare)

Stenotele – 6.0 – 8.5 \times 6.0 – 7.5 (abundant)

Microbasic eurytele – 9.0 – 10.0 \times 4.0 – 4.5 (abundant; more at tip)

Desmoneme – 4.0 – 5.0 \times 3.5 – 4.0 (abundant)

Newly released medusa

Basitrichous isorhiza – 8.0 – 10.5 \times 8.0 – 9.0

Stenotele – 8.0 – 8.5 \times 7.0 – 8.0

Microbasic eurytele – 9.0 – 10.5 \times 4.0 – 4.5

Desmoneme – 6.0 \times 4.0

Etymology.—The species name is derived from the word “obypa”, in the language of the Brazilian Tupi natives, meaning green, the color of the blastostyles. It is pronounced “õ-bi-pã”.

Development of medusa.—Medusae kept in the laboratory, despite several different combinations of temperature, salinity, type of food and volume of culturing water, grew slowly and did not change significantly in

morphology. Medusae usually did not capture food by themselves. Ingestion occurred only when the offered nauplius was touched to the manubrium; we never saw the transfer process of the prey from the tentacles to the mouth of the medusa. From the several cultures started only one batch had medusae with gonads, although even these were not completely developed (medusae 25 days old, from colony collected 17 Jun 1996, kept at 19°C). We are aware that these unsuccessful efforts probably indicate the cultivated medusae do not represent the species under natural conditions, but we decided to include our observations on growth rate and morphology. Developing gonads were first observed in 7 to 9 d old medusae. These medusae were 1380–1440 μ m high, 1050–1150 μ m in maximum diameter and had tentacles with 6 knobs, attaining ca. 800 μ m in length (Fig. 2C, D). They lived 16 more days, maintaining approximately the same size and general features except for a slight growth of the gonads, which bulged a little around the middle of the manubrium. Tentacles developed up to 7 nem-

Table 2.—Morphological character variation of newly-released medusae of *Ectopleura obypa*, new species, from three different colonies.

	[average \pm SD (range)]
Height (μm)	594.5 \pm 101.9 (460–780)
Maximum diameter (μm)	516.0 \pm 82.1 (396–660)
Diameter at base (μm)	344.5 \pm 69.6 (240–440)
Diameter of aperture (μm)	\sim 120
Length of manubrium (μm)	510.2 \pm 141.7 (276–780)

atocyst knobs. The number of tentacles did not change in any specimens during growth; nor was there any indication that the two other perradial bulbs would give rise to tentacles.

Remarks.—This description of *Ectopleura obypa*, new species, especially color, size and general shape, is based mainly on live material. Colors in fixed material disappeared. Some anesthetized and fixed hydranths, although well preserved, did not keep their natural shape: hydranths from AM1324 are inflated and most have the upper part of the neck dilated. Fixed medusae usually have longer manubria than live specimens, and perradial and interradial grooves appear in the umbrella (as also observed for *E. sacculifera*, see Brinckmann-Voss 1970:28).

The long, flexible and contractile neck enables the hydranth to bend in any direction. In still water under laboratory conditions, the hydranths performed regular circular movements interspersed with strong contractions of the neck. We could not ascertain the number of ridges in the endoderm of hydrocaulus, but we suppose the two bands of white pigments present along the neck indicate the existence of two of these ridges in *E. obypa*. The blastostyles were so vivid a green, even early in development, that when fully developed the whole hydranth appeared green to the naked eye. The medusa started pulsating hours before liberation, already capable of catching and ingesting food, and the manubrium moved peristaltically and vermicularly.

Besides *E. obypa*, new species, two other species of *Ectopleura* were recorded from the region of São Sebastião: *Ectopleura dumortieri* (Van Beneden, 1844) and *Ectopleura warreni* (Ewer, 1953) (see Migotto & Silveira 1987:100–103, Migotto 1996: 24–25). The polyp of *Ectopleura dumortieri* is solitary, and has free medusae with 4 marginal tentacles; *E. warreni* has fixed gonophores.

Ectopleura obypa is referred to a large group of species diagnosed by the presence of free medusae with 8 meridional nematocyst tracks in the umbrella, issuing in pairs from tentacle bulbs (Schuchert 1996: 107). Complementary characters are: evenly rounded umbrella; four radial canals and tentacle bulbs; manubrium short, not extending beyond bell margin; medusa tentacles moniliform or with abaxial nematocyst clusters (Schuchert 1996:107). The cnidome of species having free medusae is characterized by microbasic euryteles (besides other types such as stenoteles and desmonemes), a type of nematocyst not present in the species of *Ectopleura* with fixed gonophores (see Petersen 1990:160; note that the author interchanged the distribution of anisorhiza and microbasic euryteles in figure 19, characters 2 and 6).

Among species of *Ectopleura* with free medusae, two subgroups are clearly recognized on the basis of the number of marginal tentacles in the medusa: 2 tentacles and 4 tentacles.

Species described as having 4 perradial tentacles are *E. americana* Petersen, 1990, *E. dumortieri* (Van Beneden, 1844), *E. be-*

Table 3.—Comparisons of morphology of species of *Ectopleura* having two-tentacled medusae. Information from Brinckmann-Voss (1970), Calder (1988), Kramp (1957), Mayer (1990), Petersen (1990) and Thornely (1900).

	<i>E. wrighti</i>	<i>E. pacifica</i>	<i>E. mayeri</i>	<i>E. xiamenensis</i> ^{a,b}	<i>E. sacculifera</i> ^a	<i>E. minerva</i> ^a	<i>E. obypa</i> new species
Hydrocaulus	equal in width throughout, with 2 endodermal ridges	with 2 endodermal ridges	increasing in width from base to distal end, with 2 endodermal ridges	—	—	—	increasing in width from base to distal end, with 2 endodermal ridges
Length of hydrocaulus	10–20 mm	10–20 mm	up to 25 mm	—	—	—	up to 30 mm
Aboral tentacles	11–20; circular in cross section	15–20; circular in cross section	17–22; circular in cross section	—	—	—	16–30; laterally flattened
Oral tentacles	5–10; not adnate to hypostome, moniform	12–18; slightly adnate to hypostome; nematocysts concentrated in a swollen tip	15–20; not adnate to hypostome, filiform, with evenly distributed nematocysts	—	—	—	14–19; slightly adnate to hypostome nematocysts concentrated in a distal capitulum and on 1–3 adoral swellings
Number of blastostyles	5–8, short, dichotomously branched	6–8, short, dichotomously branched	8, short, dichotomously branched	—	—	—	4–14, long; occasionally bifurcated
Sexual condition of attached medusa	without gonads	without gonads	without gonads	—	—	—	without gonads
Manubrium	as long as bell cavity	?	$\frac{2}{3}$ length of bell cavity	as long as bell cavity	$\frac{1}{2}$ length of bell cavity	$\frac{2}{3}$ length of subumbrellar cavity	$\frac{1}{2}$ length of bell cavity
Umbrella	liberated medusa 1 mm high, nearly hemispherical; thin; without apical projection and canal (?)	mature medusa not known	2.8 mm high before liberation, dome-shaped; with apical projection; thin	0.7 mm high, dome-shaped, without apical canal; thin	3 mm high, slightly conical; thick; without apical canal	2.5 mm high; pear-shaped; with apical projection and apical canal	up to 1.5 mm high; dome-shaped; with apical projection

^a Hydroid stage not known.

^b Data obtained from Petersen (1990).

thae (Warren 1908) and *E. indica* Petersen, 1990.

Besides *E. obypa* there are six species of *Ectopleura* having medusae with 2 opposed tentacles: *Ectopleura wrighti* Petersen, 1979, *E. pacifica* Thornely, 1900, *E. mayeri* Petersen, 1990, *E. minerva* Mayer, 1900, *E. sacculifera* Kramp, 1957, and *E. xiamenensis* Zhang & Lin, 1984 (see Table 3). The last three of these are known only from the medusa stage. *Ectopleura sacculifera* and *E. xiamenensis* do not have an apical canal, contrasting in this with *E. minerva* and *E. obypa*. Moreover, *Ectopleura sacculifera* is clearly distinct from the rest by having a thick umbrella and pendent gonads on the manubrium wall (Kramp 1957:7, plate 3, figs. 1–3). Neither an apical canal nor an apical projection were mentioned by Brinckmann-Voss (1970:25–27) in the description of young and adult medusae of *E. wrighti* (as *E. larynx*), and we suppose they are not present in this species. Nematocyst clusters of the marginal tentacles in medusae of *E. obypa* are clearly different from those of *E. minerva* Mayer, 1900 (Mayer 1900, fig. 125) and *E. sacculifera* (cf. Brinckmann-Voss 1970:28, fig. 29.1), which are exclusively abaxial and do not involve the tentacle as in *E. obypa* (exclusively abaxial clusters of nematocysts are also present in an unidentified species of *Ectopleura* with a two-tentacled medusa described by Schuchert 1996:112, fig. 67).

It is difficult to link the species known only by the medusoid stage with polypoid stages already described in the literature, due to the lack of life cycle studies. Except for *E. wrighti* (see Brinckmann-Voss 1970:25, as *E. larynx*) and *E. obypa*, data on medusa stages are few and based on immature specimens still attached to blastostyles. *Ectopleura wrighti* is the only species in which medusae obtained from hydroid colonies were raised through maturity (Brinckmann-Voss 1970:25). Petersen (1990:166) described *Ectopleura mayeri* (= *E. pacifica* of Calder 1988:53–55) as a “new species”, even though he acknowledged the possibil-

ity of its being the hydroid stage of *E. minerva* Mayer, 1900, because the medusa of the first “has not been reared to a stage where it can be identified with certainty”.

Hydroid stages of other species with two-tentacled medusae have many similar features: general size, number of oral and aboral tentacles, and number of blastostyles. They all have 2 endodermal ridges in the hydrocaulus, but this character is shared with other species having different numbers of tentacles. The aboral tentacles of *E. obypa* and *E. pacifica* are slightly adnate to the hypostome, in which they differ from *E. wrighti* and *E. mayeri*. *Ectopleura obypa* differs from *E. pacifica* in the morphology of its oral tentacles (see Table 3), and is unique in having flattened aboral tentacles.

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